7: Lewis S-5 (ca. 1940-45) 1948 MD1 Syria MD1

Malaria and Its Control

Foggaras and surface canals easily become partly blocked by vegetation, and floods and rain wash in mud and silt. The water is then ponded back, depressions near the canal bank fill, the canal may overflow, and, if it is built along the side of a valley, overflow or seepage will maintain swamps along the watercourse. Artificial blockages of foggaras also pond back the water. Near the lower end of most canals are "brick pits" from which earth has been taken to be made into mud bricks, and these also tend to fill with water. Everywhere wadis carry rain and seepage water in winter and spring and the overflow from irrigation canals in early summer and autumn, at which seasons there is a surplus. In other words, except during the peak irrigation and evaporation period of midsummer, they carry slow-moving, half-stagnant water.

All these places are potential, and most of them actual, breeding places of the mosquito *Anopheles sacharovi*, which favors shallow, sunny, warm waters, full of aquatic vegetation. At only one place in the area has another malaria carrier, *A. algeriensis*, been found, and the problem of malaria control in the region is thus essentially that of eliminating the *A. sacharovi* breeding grounds. Full statistics are not available, but such figures as do exist show the great need of such control. About 20 per cent of the patients treated by a mobile clinic in the region in 1942–1945 were suffering from malaria, and the percentage rose at times (especially in late summer) to 80 in some villages. Sometimes practically the whole population of a village was found to be infected. In Tell et Tout (population *c.* 550) about 50 deaths were due primarily to malaria in 1941, and almost the sole source of infection was the swamp caused by the deliberate blockage of a foggara.

Control work is apparently simple. Canal owners occasionally clean the canals of detritus and vegetation and repair the banks at the lower end. It is important that this work be done well and repeated every few years. Small depressions may be sprayed, filled with earth, or drained by a simple ditch. Broad, sluggish streams may be canalized by a ditch along the thalweg. The more efficient the irrigation, the less likely it is that mosquitoes will breed. Waste of water should be reduced to a minimum and a wide range of crops grown, so that irrigation begins early in the season and ends late. The "waste" water of natural watercourses may be utilized by the construction of a simple dam and gravity canal, or by the repair of the old subparallel foggara if, as is probable, there is one. Extensive stretches of swampy ground may be put to good use by drainage-irrigation schemes, which often include the repair of old foggaras. Malaria control should not stand on its own, an expensive

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of the Muzeirib swamp lands along the headwaters of the Yarmuk River. The resettlement program in the Euphrates and the Khabour river basins, which is controlled by a separate governmental organization, calls for the irrigation of extensive areas. Between 20,000 and 30,000 acres had been opened up through irrigation in 1951. Work on the drainage and the irrigation of the Ghab marshes, covering about 100,000 acres in the Orontes river valley northwest of Hama, was started in 1952.

Waste Disposal

Sewerage systems are available in all the larger cities. The sewage is not treated, however, and the effluent is usually discharged into adjacent watercourses or upon the land for irrigation purposes. In unsewered sections, cesspools are employed in connection with the houses. The methods of sewage disposal are universally primitive in the rural districts. In villages near the larger cities, pit or shallow latrines are frequently found in the individual compounds or provided on a community basis. In the more remote areas and in the poorer villages, pollution of the soil is the general practice. The use of night soil for fertilizer is common in the agricultural communities.

Fauna and Flora

Arthropods. Mosquitoes. Nine species of anopheline mosquitoes have been reported from Syria, three of which—*Anopheles superpictus, A. sacharovi* (— *A. elutus*) and *A. claviger* (— *A. bifurcatus*)—are of major importance in the transmission of malaria. *A. pulcherrimus, A. hyrcanus, A. algeriensis* and *A. sergenti* are of minor and local significance, while *A. marteri* and *A. multicolor* are rare.

A. superpictus is widely distributed. It is a prominent vector of malaria in the coastal plains, in the northwestern highland districts and in the river valleys, but is of secondary interest in the Damascus region. It breeds along the margins of the larger rivers and on the edges of mountain streams

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62:Simmons et al G-5 (1941-1951) 1954
M1 Middle East
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up to 4,000 feet elevation, in sunlit pools in dried stream beds and in irrigation canals and seepages. Except at the higher altitudes, it is abundant from May to October, with peaks of activity between July and September. *A. sacharovi* is also a primary vector in many areas, breeding in swamps, irrigation canals and seepages, neglected water tanks and numerous other artificial collections of water. It is one of the principal vector species on the oasis of Damascus, where the miles of irrigation canals and numerous swampy depressions create favorable conditions for breeding. It is found breeding from March to November, but most prolifically in June and July. *A. claviger* is chiefly restricted to the towns and the surrounding villages, where it breeds in wells, cisterns and seepages, often even during the winter months. With *A. sacharovi*, it is responsible for the transmission of most of the malaria in the vicinity of Damascus and Aleppo. *A. sergenti* is a significant vector in the rice-growing areas in the Belikh and the Khabour valleys. *A. pulcherrimus* is also plentiful in the river basins of the northeastern provinces, and is regarded primarily as a pest.

Two species of *Aedes* are known to be present—*Aedes aegypti* and *A. mariae*. *A. aegypti* is widespread in the western provinces, where it is the vector of dengue fever. Numerous species of *Culex* have been identified, but all are pests of no recognized medical importance.

Mosquito control work is carried on by the antimalaria service of the Ministry of Health, and in the cities of Damascus and Aleppo by the municipal authorities. Larvicidal measures, using DDT or oil sprays, are undertaken in the cities and the larger towns; however, residual spraying, with DDT preparations or Gammexane, is the usual means of control in the rural villages. A mosquito control program, based upon the residual spraying of dwellings and other buildings, was initiated in the villages around Damascus in 1949, and in the Hauran region in 1950, by the Ministry, in

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144 co-operation with the Near East Foundation and other agencies. Similar operations have also been conducted by the Ministry in the town of Latakia and in the administrative center and the adjacent farms in the Jebel ed Druz area. In 1950, the government program covered a total of 224 villages, with an aggregate population of slightly over 180,000. A shortage of DDT necessitated the curtailment of the program in 1951, but the Ministry proposes to expand its activities to other malarious districts throughout the country as rapidly as possible. A demonstration control program was started in 1952 in the vicinity of Homs under the auspices of the World Health Organization. Anopheline control measures are carried on by the United Nations Relief and Works Agency in and around the refugee camps situated in malarious regions.

136 164 FLIES. Flies of the family MUSCIDAE are numerous, including *Musca domestica vicina, M. tempestiva, M. sorbens, M. vitripennis* and *Muscina stabulans*. They are abundant around markets, food shops and dwellings, and are undoubtedly implicated in the spread of intestinal infections. The stable fly, *Stomoxys calcitrans*, is prevalent. The myiasis-producing flies, *Chrysomyia albiceps, Calliphora erythrocephala, Oestris ovis, Lucilia sericata, Gasterophilus haemorrhoidalis, Wohlfahrtia magnifica* and species of *Sarcophaga* are known to be present, and are probably responsible for occasional cases of infection in man.

At least 6 species of sandflies are found in Syria. *Phlebotomus papatasii* and *P. sergenti* are involved in the transmission of cutaneous leishmaniasis, which is endemic in many parts of the country, particularly in the vicinity of Aleppo. *P. chinensis* and *P. major* occur and are potential vectors of visceral leishmaniasis, although the extent of indigenous infection is uncertain. *P. papatasii* is also the vector of sandfly fever, which is sporadic in this region.

144 136 571 A fly-control campaign was inaugurated in Damascus in 1946. The dwellings in the poorer sections of the city and the tanneries,

744 the refuse dumps and other breeding sites
136 are sprayed with DDT preparations at in-
511 tervals between May and October.

136 LICE. Infestation with lice is common
511 among the inhabitants in the congested
361 quarters of the towns and in the villages and the Bedouin encampments. *Pediculus humanus corporis* is important as the vector of typhus fever; cases are reported almost annually. *P. humanus capitis* and *Phthirus pubis* are somewhat less frequent.

136 FLEAS. Numerous species of fleas para-
164 sitize the wild and the domestic rodents. The rat flea, *Xenopsylla cheopis*, is prevalent: it is the vector in sporadic cases of murine typhus, and in past decades it was implicated in the transmission of plague. The human flea, *Pulex irritans*, and the cat and the dog fleas, *Ctenocephalides felis* and *C. canis*, are widely distributed. The stick-tight flea, *Echidnophaga gallinacea*, sometimes attacks man, but it is of no known medical significance.

136 BEDBUGS. *Cimex lectularius* is an annoying pest in all parts of the country.

136 TICKS AND MITES. A variety of ticks,
232 including *Rhipicephalus sanguineus* and
164 several species of *Hyalomma*, infest the livestock. *Ornithodorus tholozani* is found in the rural areas, where it is the local vector of tick-borne relapsing fever.

136 The grain itch mite, *Pediculoides ventri-*
164 *cosus*, is plentiful in the grain-producing regions. It frequently attacks man, causing a painful rash. The human itch mite, *Sarcoptes scabiei*, is widely distributed, but it is decreasing steadily in prevalence.

136 SCORPIONS AND SPIDERS. Several species of
752 scorpions are present, including *Buthus quinquestriatus*, *B. judaicus*, *B. crassicauda* and *B. europeus*, and *Scorpio maurus propinquus* and *S. maurus fucus*. Serious systemic effects resulting from scorpion stings
[135] are rare, but deaths are sometimes recorded among young children, usually after attacks by *B. quinquestriatus*.

136 The poisonous black spider, *Latrodectus tredecimguttatus*, is found in some localities.

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Reptiles. Venomous snakes are not common, but at least 4 species of vipers are known to be present. The carpet viper, *Echis carinatus*, exists only in the north, while *Vipera lebetina lebetina*, *V. lebetina xanthina* and *V. palaestina* are reported from many parts of the country. 136

Rodents. Rats and mice are numerous. The usual domestic rats are *Rattus rattus rattus* or *R. rattus alexandrinus*. *R. norvegicus* sometimes invades the port towns of Latakia.

Molluska.* The fresh-water snail, *Bulinus truncatus* (— *B. contortus*), inhabits some of the tributaries of the Belikh and the Khabour rivers, near the Turkish border. It is the intermediate host of *Schistosoma haematobium*, which is reported from several foci in that region. 136 164

Plants. Various trees, weeds and grasses are capable of inducing allergic manifestations in susceptible individuals, but no precise information is available. 137 752

The broad bean, *Vicia faba*, which is grown extensively as a food, may be toxic to young children when it is eaten raw. A few deaths are observed each year, among children in both urban and rural communities. Occasional cases of lathyrism occur when the "Indian pea," *Lathyrus sativus*, a plant widely cultivated for fodder, is used for human consumption. [135]

Food Sanitation

Municipal regulations govern the sanitation of the food supplies in the cities of Damascus, Aleppo, Homs, Hama and Latakia. Restaurants, markets and other premises where food is sold are inspected at regular intervals by the municipal sanitary officers, and food handlers are required to register for examination at 6-month intervals. Municipal slaughterhouses are established in towns with populations of 20,000 and over, and are operated under the supervision of the health authorities. The meat animals are inspected before and after slaughter by veterinary officers of the Min- 744

* See footnote, page 10.

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164 the Qoubour el Bid section of the Al Jazira, along branches of the Khabour River north-
● 136 east of Hassetché. *Schistosoma haemato-*
164 *bium* is the only species identified in confirmed cases, but rectal complications are sometimes recorded. At present, the disease is confined to circumscribed foci, but in view of the irrigation and the agricultural potentialities of the region, its control is of
164 major public health significance. The foci
361 are apparently of recent origin. Whether the
169 infection was introduced by Senegalese
744 troops stationed in the vicinity, as claimed by the local inhabitants, or by nomadic tribes from Iraq is a matter of conjecture. Surveys have been made within recent years, under the auspices of the Ministry of Health and co-operating international organizations, and, although some discrepancies are evident in the determination of the infection rates in different villages, all emphasize the seriousness of the problem. Competent local authorities estimated in 1951 that the total incidence in that year approximated 12,000 cases.

659 In surveys undertaken in 1948,[24] the ex-
164 amination of urine samples collected from 545 persons in Qoubour el Bid and neighboring villages on the Gerahi branch of the Khabour River indicated general infection rates of about 62 per cent. They averaged 73 per cent among the men and the boys, and 49 per cent among the women and the girls. Moreover, they were consistently higher, in both sexes, in individuals under 20 years than in the older age groups.
[361] Equally high infection rates were found among the seminomadic peoples in the Tell Abiad area. A system of spot checking suggested probable infection rates of almost 100 per cent among males and of 60 per cent among females in 3 of the 5 villages visited.

164 A more exhaustive investigation in 1950[25]
659 revealed the presence of infection among
361 about 24 per cent of the inhabitants of 58 villages situated along 4 tributary streams in the Qoubour el Bid area. The infection rates ranged from 1 to 88 per cent: the most

highly infected villages were situated on the Gerahi and the Soublakh wadies. Similar surveys in 9 villages in the Tell Abiad area showed an average infection rate of 77 per cent, with the greatest prevalence in the villages on the Tell Abiad and the Slouq branches of the Belikh. Infection is apparently acquired early in life through swimming, washing or other contact with streams inhabited by infected snails. The intermediate host, *Bulinus truncatus*, has been collected from several localities.

Two mobile treatment teams were operated by the Ministry of Health in the infected areas in 1951. Plans for the inauguration of a snail eradication program were also under consideration.

OTHER HELMINTH INFECTIONS. Infection with one or more varieties of intestinal worms is prevalent in all parts of the country. The insanitary habits of the people and the frequent use of night soil as fertilizer promote the spread of the different species. Ascariasis is widely distributed. Infection rates ranging from 30 to 86 per cent have been demonstrated in Aleppo, Damascus, Homs and Hama, as well as in the surrounding villages. The infection is most prominent among the children, in both urban and rural areas. Trichuriasis is also widespread, but enterobiasis and strongyloidiasis tend to be sporadic.

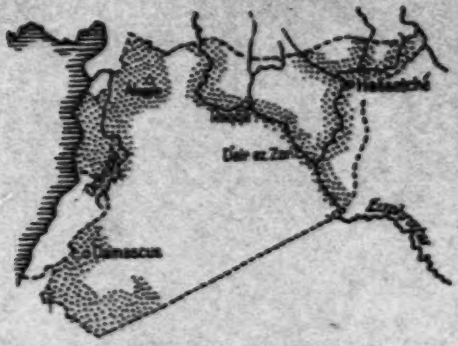
Taeniasis is common. The beef tapeworm, *Taenia saginata*, is enzootic among the cattle, and the popularity of raw, or underdone, meat in certain national dishes is responsible for considerable human infection. The pork tapeworm, *T. solium*, is sometimes encountered among the Christian communities. Occasional infections with the dwarf tapeworm, *Hymenolepis nana*, are observed in most districts.

Hydatid disease is not unusual. *Echinococcus granulosus* is enzootic among dogs, sheep, goats, cattle and camels. In studies reported in 1936,[40] cysts were detected in 25 to 30 per cent of the sheep and the goats examined in slaughterhouses in Aleppo, Damascus and Homs. Infection was uni-

Relief and Works Agency for Palestine Refugees and the Ministry in the Khabour and the Belik river basins in 1950,[8,9] blood examinations were performed on small representative samples of the population. All age groups were included, although the majority of persons tested were under 15 years of age. The parasite rates averaged about 33 per cent in villages in the Belikh valley, while in the areas under perennial irrigation along the Khabour River and its tributaries, they varied from 33 to 94 per cent. In the rain-irrigated districts northeast of Hassetché, the rates declined to from 12 to 16 per cent. In many localities the malaria problem has been aggravated by the introduction of rice cultivation. In some, as in Ajaja, cultivation had to be abandoned, and in others, it is prohibited within a 2-mile radius of the villages.

The malaria season extends from April to November, with peaks of prevalence in July and October, but some transmission occurs throughout the year in most malarious regions. The relative proportion of *Plasmodium vivax* and *P. falciparum* infections varies according to the season and from place to place. *P. vivax* is usually responsible for 75 to 80 per cent of the cases of malaria in the Damascus area. *P. falciparum* and *P. vivax* were identified with about equal frequency, however, in the 1950 surveys in the Belikh and the Khabour valleys. In general, *P. vivax* predominates during spring and early summer, but is superseded by *P. falciparum* toward the end of the malaria season. *P. malariae* infections are rarely encountered.

Malaria control measures are undertaken by the municipal authorities in Damascus, Aleppo and a few other towns. Control programs, based upon residual spraying with DDT preparations or Gammexane, are conducted in towns and villages in limited areas by the Ministry of Health, often in conjunction with other agencies. In 1950, they covered villages in Damascus and Hauran provinces, the town of Latakia and a few localities in Jebel ed Druz. The most exten-



Distribution of Malaria in Syria

sive work has been carried on, in co-operation with the Near East Foundation, in the agricultural districts around Damascus where 224 villages with over 180,000 inhabitants were protected in 1949-50. A marked reduction in the number of cases has been noted in all the areas treated. Successive examinations of over 500 children in 16 treated villages near Damascus revealed a decrease in spleen rates of from 78 per cent in 1950 to 20 per cent in 1951.[8] A malaria control program was inaugurated in the Homs district in 1952, under the auspices of the World Health Organization. *Anopheles sacharovi* and *A. claviger* are the principal vectors in the Damascus region; *A. sacharovi* and *A. superpictus*, in the river valleys in the northeast.

Rickettsial Infections. Localized outbreaks of louse-borne typhus are recurrent during the winter and the spring months, particularly in the congested quarters of the towns and the cities and among the nomadic tribes. Over 1,900 cases were reported in 1942, when the acute shortages associated with the war created conditions conducive to the spread of the infection. Since that date no more than 30 to 95 sporadic cases have been recorded in any one year. Control measures, including deverminization procedures and the immunization of the exposed populations, are enforced by the health authorities in affected areas.

No differentiation is made in the official